FINAL REPORT

Phase One User Research
For Data Warehousing/Analytics/Dashboards (D.A.D.) Initiative

Presented to the D.A.D. Core Team
University of North Texas

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Executive Summary

1. Overview of Study
The UNT Data Warehousing/Analytics/Dashboards (D.A.D.) Initiative's first objective was the identification of key decision-making data needs of the Chancellor and Presidents, Cabinet Members, and Vice Chancellors. The D.A.D. Core Team appointed a research team to obtain this information. Using findings in this report, the Core Team will assemble a data warehouse that will supply most of the identified needs with analytical capabilities and dashboards. The research team conducted 17 interviews. Interviewees were carefully selected to include balanced representation from all four UNT institutions. The research demonstrated a serious effort by the D.A.D. Core Team to listen to the voice of the users.

2. The Organizational Context
Interviewees' experiences with the technological aspects of obtaining and analyzing data were situated in broader organizational structures and processes that sometimes created challenges for users. We labeled one of the key organizational aspects we observed the "core-periphery" phenomenon. Studies have found that when parts of an organization that are geographically separated from each other collaborate, the site that has the most power tends to dominate in decision-making processes. In many situations, Denton acted as a "core" in this sense, although sometimes the System took that role. We also noted that UNT's history of data warehousing efforts was not as successful as it might have been. This history produced a culture of skepticism in current users.

3. Information Needs
System-wide information needs included standardized data for external reporting, predictive information, the ability to map complex processes, and various kinds of student data. Some information needs were specific to an institution and related to its unique history and ongoing projects. Other information needs were particular to a function such as strategy or finance. We identified key needs for each of these groups, and whether each need was fully met, partially met, or not met.

4. Pain Points
Pain points in obtaining data included the need to find the right person who could provide that information, and the length of time it might take to receive the information. With regard to analysis and reports, interviewees identified pain points related to information siloes, uncertainty about data reliability and whether data were used correctly, the high number of ad hoc requests, and the shortage of staff with technology skills.

5. Dashboards: Current and Desired
While few of the interviewees had dashboards at their disposal, most of them were eager to obtain them and envisioned valuable benefits. Only four interviewees already had what they considered a reasonable dashboard. Desired characteristics of dashboards included simplicity, customizability, and the ability to drill down into the data.

6. What Is Success and How To Get There: Insights from Interviewees
While each interviewee had a somewhat different definition of success for the D.A.D. initiative, we found six common factors that, taken together, generally defined success from the point of view of the interviewees. These factors were: the initiative is perceived as realistic and

achievable; it serves all institutions equally; it has resulted in easier and quicker access to information; data are perceived as accurate and trustworthy, and there is a data dictionary; the initiative provides effective analysis tools; and potential users choose to use the new data warehouse/analytics/dashboards and experience satisfaction with their use. Interviewees also identified ten critical steps on the path to success.

7. Other Recommendations
In conclusion, we offered seven additional suggestions for the D.A.D. initiative that may not have been explicitly articulated by the interviewees, but that became evident through our analysis of the transcripts. They included: maintain communication about the initiative with interviewees and others; highlight steps toward success; ensure that dashboards are simple but customized; ensure that dashboards and reports include the ability for users to drill down; strengthen predictive capabilities; accommodate new technology developments; and enable users to contribute to institutional memory.

1. Overview of Study

The Data Warehousing/Analytics/Dashboards (D.A.D.) Initiative
The D.A.D. Initiative is endorsed by Lee Jackson (UNT System Chancellor), Neal Smatresk (President, UNT Denton and Project Sponsor), Michael Williams (President, UNT HSC), Bob Mong (President, UNT Dallas), and Rama Dhuwaraha (UNT System Interim Associate Vice Chancellor and Chief Information Officer). The first objective of this initiative was to identify the key decision-making data needs of the Chancellor and Presidents, Cabinet Members, and Vice Chancellors. The D.A.D. Core Team appointed a research team to interview and collect this data from each UNT institution. With the research team's findings in the report below, the Core Team will assemble a data warehouse that will supply most of the identified needs with analytical capabilities and dashboards. Additional departmental, college and staff needs will be identified in subsequent phases of this project.

Goals of Research
The user research described in this report was requested by the D.A.D. Core Team in June/July 2015. The purpose of the research was to meet the D.A.D. Initiative phase one project goal, as stated in the team charter:

> *The phase one goal of this project is to identify key needs of the Chancellor and Presidents as they relate to data warehousing in order to assemble a data warehouse (DW) that meets most of those analytical and dashboard needs.*

To meet this goal, we conducted 17 interviews with the Chancellor/Presidents and their cabinet members. This report presents findings from those interviews.

The user research demonstrated a serious effort by the D.A.D. Core Team to listen to the voice of the users. Interviewees were carefully selected to include balanced representation from all four UNT institutions. A cross-section of functions was selected, with weight given to general leadership, student recruitment/enrollment, finance, and strategy.

Timeline
The timeline for this research was quite aggressive. Plans were finalized at a meeting between the researchers and the D.A.D. Core Team on July 1. We immediately applied for IRB approval and received it on July 8. Interviews took place from July 13-August 25, with most completed in July. We engaged in data analysis during August and the start of September.

Research Team
The research was led by Christina Wasson, with most of the work being completed by Heather Roth. Bill Moen, a member of the D.A.D. Core Team, was an invaluable liaison between the user researchers and the rest of the team.

Christina Wasson
Professor, Department of Anthropology, University of North Texas
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Christina Wasson has been active in the field of design anthropology since 1996. After obtaining her Ph.D. from Yale that year, she was hired as Project Manager at E-Lab, a design firm that pioneered the integration of user research and design. Researchers at E-Lab used

anthropological fieldwork methods to learn how people used products in their work and home life. Wasson subsequently taught at DePaul University 1999-2001, and UNT 2001-present. She has developed an internationally recognized specialty in design anthropology for the UNT anthropology master's program. Wasson was a founding organizer of the international Ethnographic Praxis in Industry Conference, and has been keynote speaker at numerous conferences that bridge user research and design. She is primarily interested in the design and use of technologies, and has conducted projects for Motorola, Microsoft, Texas Instruments, and Nissan's lab on autonomous vehicles.

Heather Roth
M.A. Candidate, Department of Anthropology, University of North Texas
Heather Roth's research focuses on user experience, design, and technology. In fall 2014 she was part of a group of students that conducted research for the Nissan Research Center in Silicon Valley about what people actually do when they're driving to better inform the design and engineering of self-driving cars. Her master's thesis project is to help develop a website for a start-up firm that consults on educational approaches for Native American students. Her research goals center on providing an authentic user voice for the enhancement of design practices, and ultimately, successful interactions with technology. She is currently the Interactive Media Coordinator for the Society for Applied Anthropology Podcast Project and co-president of the Graduate Anthropology Student Association at UNT.

Methods
Following an anthropological approach to user research, the interviews were semi-structured. This means that we prepared an interview guide – a list of questions – but we also asked follow-up questions as appropriate, based on information revealed by the interviewee during the conversation. We strove to build rapport in the interviews, and worked hard to avoid leading questions. The interview guide is in the Appendix of the report.

The majority of interviews were conducted by Heather Roth. In some, she was joined by Christina Wasson, Rama Dhuwaraha (UNT System Chief Technology Officer and D.A.D. Core Team leader), and/or Bill Moen.

The interviews were audiorecorded and transcribed. The transcripts and notes were then analyzed using Dedoose, an online qualitative analysis program. Dedoose allows users to code portions of text by selecting and tagging them. The codes are custom-created by the user. Coding the interview transcripts made it easy to find all examples of a particular phenomenon, for instance "information needs" or "pain points – ad hoc queries." Dedoose can produce reports of all quotes tagged with a particular code. In all, we created 33 codes and applied them to 952 excerpts. The analysis was mainly conducted by Heather Roth, under the guidance of Christina Wasson.

In the chapters that follow, we illustrate our findings with quotes from the interviews. Since we reported on shared patterns across interviewees, there were usually many relevant quotes to choose from; we selected only the most eloquent or the most typical ones. Also, we did not identify sources of the quotes because we didn't want to focus on unique aspects of individual experience, but rather shared aspects of experience across interviewees. We also wished to protect the anonymity of the interviewees.

Interviewees
We arranged interviews with 17 people. In some cases, they brought along additional people, so a total of 22 people participated in the interviews. Of the 17, four were with UNT System, four with UNT HSC, four with UNT Dallas, and five with UNT Denton. Their functions were spread out across general and academic leadership (4), strategy and institutional research (4), finance (4), students (2), research (2), and human resources (1).

A Comment on the Scope of the D.A.D. Initiative
The long-term goal of the D.A.D. initiative, to create an effective system of data warehousing, analytics, and dashboards for UNT, is extremely important, but also extremely ambitious. In interviews, we heard again and again about frustrations concerning previous efforts. This means that the D.A.D. Core Team is simultaneously addressing a series of technological challenges and a cultural legacy of skepticism. It is wonderful that the team is trying to turn around a history of disappointment and head toward unprecedented levels of customer satisfaction. At the same time, the large scope of the endeavor means it will take years to accomplish. We understand that the team is planning a stepwise, agile approach to the process; this seems exactly right for the circumstances.

2. The Organizational Context

"Software doesn't make a crooked road straight," noted one of our interviewees. The interviewees' experiences with the technological aspects of obtaining and analyzing data were situated in broader organizational structures and processes that sometimes created challenges for users. Over time, these organizational structures and processes had produced particular beliefs, ways of accomplishing tasks, and relationships between members of organizational units.

In this chapter, we describe key aspects of UNT's culture and social structure that impact and are impacted by the technological aspects of data warehousing, analytics, and dashboards. Our findings are informed by an anthropological perspective and familiarity with the literature on technology use in organizations.

Core-Periphery
When parts of an organization that are geographically separated from each other collaborate on work processes, a "core-periphery" dynamic often emerges. This issue has been well documented in studies of collaboration across large, multi-sited organizations. The site that has the most power in the organization – usually the corporate headquarters – tends to dominate in multi-site decision-making processes. From the point of view of people at this site, they are located at the core of the organization and the other sites seem more peripheral.

It is often hard for people who are in a position of advantage to recognize when they are not giving equal consideration to people who are in a less advantaged position. They may have the best of intentions and believe that they are treating everyone fairly. A similar dynamic plays out in many situations of historically unequal power, for instance across gender or race/ethnic differences. Men in an organization may truly make every effort to treat women equally, and believe they are succeeding. Yet women may see ways that they are given less voice in decision-making, or have a harder time getting promoted.

UNT Denton as the Core
We found this core-periphery dynamic at UNT, with a few unusual twists. First of all, in many situations, UNT Denton seemed to hold the position of "core," rather than UNT System. This is probably due to the fact that UNT historically originated in Denton, while the System layer was added relatively recently. Also Denton carries more financial weight than HSC or Dallas. Furthermore, some System services, such as ITSS, are still located in Denton even though the main System office is in Dallas.

Even within the D.A.D. Core Team, we observed that meetings were always held in Denton, which provided advantages to Denton members. Meetings did not rotate across sites. There is an obvious logic to holding meetings where the majority of members are located, but the end result is still that members of other sites have to participate virtually, or spend several hours driving to meetings.

Due to UNT Denton's prominence, it often receives the most attention when new initiatives are put forth. Many interviewees voiced this opinion when discussing the D.A.D. initiative. One in Fort Worth said:

> "I'll tell you part of it is Denton's always driven this process because they're the bigger campus, everything is housed in Denton for the most part and so they just felt ownership and I think probably it's a lot like the current situation where when you're in close proximity to people you tend to have more allegiance to serving their needs because you have to see em! You know? Because [we're] way down in Fort Worth we can just kind of squeal and make noise, but it's kind of like, nobody's going to drive up to Denton and really drive home the point. So I think sometimes that's how we've been kind of second fiddle on some of these things."

Although people in Denton sincerely seek to treat the other institutions fairly, it is often not perceived to be the case. In another example an interviewee described a staffing issue that was exacerbated by Denton's tendency to absorb the majority of resources:

> "We just don't have the staff and I realize there's a lot of programmers that, you know, work for System, but they are in Denton and they have established relationships with Denton. And they're very helpful, but because of its size, UNT [Denton] gets the attention."

Even an interviewee at the System felt an undeniable pressure to serve the needs of Denton because of its size and center of gravity:

> "My salary, my expense, it's all paid by the campuses. And UNT sends the biggest and the flashiest, they got to pay more. So we're like a vendor to them so we have to provide them with what they need. The only difference is that [when] you have a vendor or a consultant that is not providing you with what you need, you just replace them. Well you can't do that with the System."

Thus despite Denton's best intentions, people at other institutions often feel like Denton is dominant.

UNT System as the Core
There are other situations in which UNT System does act as the core. Interviewees at UNT Denton, UNT Dallas, and UNT HSC voiced complaints about some System initiatives as being System-centric and not taking the other institutions and their unique situations sufficiently into account. Oftentimes the System-level expectation is that these initiatives will benefit all UNT institutions. In reality, many initiatives have been less successful than they could have been because they were not based on accurate knowledge of particular institutions. One interviewee said:

> "When the Board of Regents gets all anxious about something going on in one of the campuses they create all these new rules and hire all these new people and put new processes in place that weren't necessary for some of the other campuses. So by trying to fix one problem you have unintended consequences and [are] creating a whole series of new ones for everybody else."

Another interviewee recalled a set of 192 Key Performance Indicators (KPIs) developed by the System as measurements for strategic success. Unfortunately the majority of KPIs were not applicable to UNT HSC, such as athletics. In another report, nine metrics were developed by the System to be equally applied to each institution. An interviewee noted that they were not all

equally relevant to UNT HSC. One metric was time to graduation. Since UNT HSC boasts an approximate 99.8% graduation rate and has no undergraduate students, the metric was not particularly useful.

Another recent example is the Boston Consulting Group project. Boston Consulting Group was brought onto the scene about a year ago to understand the financial information needs of the institutions so that they could develop dashboards for the Board of Regents. Although the project was marketed as beneficial to the other three institutions, it was really targeted to the needs of the Board. While the Board only needed high-level summaries, the other institutions would have benefited from being able to drill down and get more detailed information. One interviewee discussed his frustration:

> "If they were to design tools that serve the needs of the campuses first, and then in doing that they're able to roll up some data that could address the Board of Regents' needs for reporting and measurement – but don't design a tool just for the Board of Regents. I've seen this happen here already a few times."

Another interviewee recalled a past effort with similar results. The consulting group Alvarez and Marsal was brought in to address procurements and purchasing. The work focused on ways to make business processes more efficient. Although certain processes were streamlined in the end, such as cutting down the number of managers, the results did not consider the needs of the people who were actually interacting with procurements and purchasing. Instead the effort left out their perspective, according to an interviewee at the UNT System.

Adding to the complexity of this dual core-periphery phenomenon is the geographic dispersal of the System. While the main office is in central Dallas, ITSS personnel are located in Discovery Park, and the Vice Chancellor for HR can be found on the HSC campus in Fort Worth.

Problems When IT Personnel Are Moved Across Institutions
In our research, we came across several instances where organizational change processes that moved IT staff from one UNT institution to another created challenges. One interviewee from HSC recalled how he used to have custom-made dashboards that greatly aided in his decision-making process. When two key IT personnel were moved from HSC to the System, he lost the capacity to maintain those dashboards. This created decision-making challenges. For instance, the dashboards had a meter that showed enrollment numbers for the College of Pharmacy. Without the meter, it was difficult to tell how many more students could be accepted. The unfortunate result was accepting too few students when the program could have taken more.

In another example, an interviewee from UNT Dallas faced challenges when the split between UNT Denton and UNT Dallas resulted in a loss of services from Decision Support.

> "Things are shared or they're Denton's, or Denton used to do it for us because we were a part of them. Now all of a sudden after the split that's not going to happen anymore. But we didn't even *know* that was something that was going to go away."

This shift in IT personnel left them scrambling to find new people who could run queries, gain access to information, and obtain knowledge about data resources.

History of Efforts Related to Data Warehousing, Analytics, and Dashboards
The interviews situated recent challenges regarding data and analytics in a longer history of
data warehousing efforts that had enjoyed at best a mixed success. Factors that interviewees
identified as contributing to past problems included: a lack of well-designed information
architecture, understaffing, weak enforcement of new rules, the chronically slow UNT
bureaucracy, absence of a data dictionary, and the System's inadequately informed efforts to
standardize.

One interviewee with over 10 years of experience provided an extensive description of past
data warehouse initiatives. The first data warehouse was created using Oracle in 2004. More
commonly known as the "legacy" data warehouse, it was ultimately inadequate due to a lack of
planning and structure that went into the design. This interviewee likened the Oracle data
warehouse to a "shotgun house." A shotgun house was described as a one-bedroom home
with additional rooms stuck on the sides like random appendages. Access to any of the
outside rooms was only possibly by walking through the main rooms and so on. Thus a
shotgun could shoot clear through the front door and out the back door of the home without
touching a thing.

> "So that's what we had with this Oracle data warehouse. We just stuck elements to it,
> but no architecture, no easy way to manage it, no easy way to do updates on a regular
> basis."

The second data warehouse was Blackboard Analytics (BbA), which used an architecture of
known data elements from PeopleSoft (the platform for UNT's Enterprise Information System,
EIS). Although the BbA data warehouse is still in place, it has been inadequate in a variety of
ways. Many of the issues stem from data that are considered unreliable. The interviewee, who
was present during the implementation of the BbA data warehouse, said:

> "The problem was we had very limited people who actually [knew] the data dictionary
> information and vetting the data… so we missed our window to do a data dictionary
> and to do this process of vetting the data and making sure it was fair and accurate."

Two interviewees from UNT Dallas expressed their frustrations with the way information is
stored in BbA; in comments that also reflect the core-periphery issue, they said:

> "The data wasn't input into the system in a format that was usable for us…it's not a big
> priority for Denton to make sure Dallas is coded correctly."

Another reason for BbA's poor reputation is the limitations on how information can be
visualized. The interviewee knowledgeable on UNT's data warehouse history said:

> "Blackboard [Analytics] [was] not a bad data warehouse at all. We didn't choose a
> visualization tool that could be used easily. We went with what was free and it's
> Proclarity, and Proclarity is a very cumbersome tool."

Current User Experience
The history of less-than-stellar data warehouses, and challenges in obtaining needed data and
reports, have created a culture of skepticism in current users. Interviewees were frank about
their daily data frustrations, and in some cases took the interview as an opportunity to list

grievances with multiple aspects of the enterprise data environment. In general we found that a layer of confusion, spanning from mildly annoying to incredibly overwhelming, had seeped into the cracks of everyday business operations in all four institutions. Interviewees at UNT Denton and the System experienced the least confusion, whereas those at UNT Dallas reported the greatest burden. UNT HSC was somewhere in the middle, which may be due to increasingly independent processes that have allowed them more control.

Ambiguity surrounding the data stems from very basic questions that are somehow never fully answered. Rather the answers are partial, incomplete, and fragmented. Interviewees at all four institutions often could not obtain consistent answers (or an answer at all) to basic questions such as:

- Have the data been collected?
- Where are the data located?
- Who has the data?
- Do we have these data in our possession?
- How often are the data pulled?
- How can I process the data?
- How do I know the data are accurate?

Additional confusion stemmed from the need to find the right person to ask the question and the time it took to receive an answer. Sometimes interviewees were left to wonder for weeks after making a request. Repeated small frustrations have continued to pile on top of one another for years, contributing to a sense of helplessness about the state of data in their institution. These issues are examined in more detail in Chapter 4 on Pain Points.

Since many of our interviewees were responsible for reporting information to outside parties and higher-level offices, they were vulnerable to being blamed when the reports they provided were inaccurate. In one of our first interviews, an interviewee at UNT Denton described how a single negative experience can trigger a web of adverse responses:

> "One set of bad information can make the whole community start talking about, 'oh, I asked them for this information and they gave me the wrong information and I told my Board of Regents what they had given me and now it's wrong...' and yeah, it mushrooms into... the rumor mill runs rampant."

Shortly thereafter a different interviewee from the UNT System described the potential damage to one's reputation in similar terms.

> "People know people! Right? So they say, 'oh yeah [interviewee name] has told me this four times and never done anything about it, so why should I trust this one on the fifth time?' And that's the way it is."

The other point this interviewee made was that no matter how well-intentioned you are as a new member, the learning curve is so steep that there will be problems beyond your control that will affect how others view your reliability to report information and make decisions. A few days later an interviewee from UNT Dallas explained how they feel the need to explain why they can't produce reliable reports in a timely manner. This is mostly due to institution-wide

changes, such as the inauguration of a new President and the integration of the College of Law. The interviewee leaned in and lowered their voice:

> "It's just the air here. People are completely frustrated with the lack of information or the lack of the location of the information, the ability to kind of get it together. So it really contributes to a morale issue."

Finally an interviewee from UNT HSC described how confusion and mistrust bubble up to higher levels of reporting due to lack of consistent formats for presenting information:

> "You would have Board members that would, you know, have the opportunity to appear very knowledgeable in a certain area and want to see something different. And they would ask for different [things] and you continue to provide it and six months down the road people say, 'why aren't we seeing this? Who's looking at this? Why did we change this? I'm looking back at last year, we did it this way, why did we change..?' They would forget. So it was like this constant evolving presentation format that led them to believe the data was less reliable when in fact it was mostly just presentation variances they had asked for over time."

We found that 15 of 17 interviewees questioned the integrity of the reports they themselves sent out. Some even cited instances in which they are forced to rely on numbers in official reports, such as what the Coordinating Board has on their website, rather than what they could produce from their own repositories. The absence of a standardized format for how to handle data – from transfer into the data warehouse to extraction for reporting – contributed to this overall mistrust.

Interviewees situated challenges in obtaining data within broader cultural patterns. UNT was described as an ineffective and slow-moving organization by interviewees at all four institutions. One interviewee compared UNT to the *Titanic* and another likened it to an old battleship. The UNT bureaucracy was also criticized for being excessively controlling and confusing. Five people said navigating UNT bureaucracy was like playing a difficult poker hand or playing chess. Regarding UNT's risk aversion, one commented:

> "Why would we want grants and contracts to be the final approval for something a faculty member probably 99% of the time is doing the right thing? They're not trying to pull a fast one and do something or purchase something they can't purchase, right? I mean, have some trust around here."

Given their experience with these challenges, interviewees sometimes expressed concern that the D.A.D. initiative, no matter how well-intentioned, could fail.

> "My fear, and I'll tell you every time we have an organizational wide solution, is because of the size and complexity of this institution, the size and complexity of the Health Science Center, and the relative smallness of University of North Texas of Dallas and, the administrative function of the System office, by the time you try to engage and get everyone's needs and develop something for that, two more years have passed and we're still wallowing without the major information."

Workarounds

We found that individuals frequently created workarounds to deal with problems stemming from the inadequacy of the current data situation. These creative solutions took a variety of forms. Sometimes an individual uses materials they have at their disposal but in a different way from the original intention. For instance, two interviewees from separate institutions said they will wait until official numbers are submitted to the Coordinating Board and then go to the Board's website to pull information to ensure consistency in reporting. One example given was finding student enrollment numbers. Both interviewees preferred pulling from the website instead of using what they had on file in their office. In another case an interviewee from UNT Dallas described how he has obtained information to help in projecting financial expenditures. Since UNT Dallas is building its first-ever housing facility, and thus lacks any precedence for crunching numbers, he has mined data from UNT Denton's housing facilities and brought them down to scale.

A majority of interviewees also create their own data sources and analysis tools. These serve to avoid using inadequate resources, or to fill voids, and can span from small-scale projects to ambitious endeavors. On the light end of the spectrum, at least four interviewees said they regularly develop Excel spreadsheets to facilitate analysis and decision-making on top of the tools at their disposal. The spreadsheets are familiar and Excel offers a user interface that can serve the needs for any level of expertise.

We also found that individuals create other kinds of records to keep track of information that their system fails to do. For example, a few interviewees at UNT HSC said they do not have access to balance sheets, even after asking for them. Therefore they keep their own shadow ledgers to balance the books and encourage others to do so as well. Not only do individuals develop workarounds, but also entire institutions as well. UNT HSC recently purchased Ideate, a more sophisticated tool to track grants and proposals.

These workarounds demonstrate the collective genius of the staff at all UNT institutions and their ability to adapt to even the most uncertain enterprise data environments. As one explained,

> "We're trying to do some innovative things in an old battleship not built for speed."

The Culture of the User Is Not the Culture of IT Experts

> "There have been discussions that, you know what, we just need to hire computer programmers to go get this information. Okay? So, here's the data warehouse, we're going to start generating reports. If you don't know the data, and you don't know the pitfalls of the past ten years, a computer programmer is going to continually generate bad information."

Why are UNT personnel using workarounds to solve critical information problems? Why are people having to ask simple questions about the state of data? How is it that daily use of the UNT enterprise data landscape generates a steady stream of negative experiences? The answer lies in one of the central tenets of user-centered design—the reality of the user is not the same reality as that of an IT expert or software developer.

Many of the interviewees expressed a concern that UNT's IT systems had historically been designed without adequate input from the users. The current user study was a welcome

departure from past practices. One issue interviewees raised was the need to carefully define data with respect to specific contexts of use. In their view, IT experts often had an inadequate understanding of the contexts of use and this led them to create overly simplistic data definitions.

For instance, some interviewees are hoping that the new Chart of Accounts will become a comprehensive, system-wide data dictionary that serves as a reliable source for shared definitions. However, the creation of such a dictionary would require a meticulous understanding of the way each individual uses each data definition. One interviewee explained the underlying complexity associated with data definitions:

> "Let's say an example right now I'm getting tuition. We don't define tuition as Fall tuition, Spring tuition, Summer tuition. Now that's important for me in analysis to understand what's being generated when. Right now we have "tuition" okay? If I collect tuition for Fall right now, the history of the institution has been to defer all of the tuition we collect for Fall into next fiscal year. In September, our fiscal year starts in September. So we collect it now, but say it's really associated with the next fiscal year but the semester starts before the fiscal year starts. And so you have to do a manual manipulation of that. So even the definitions of some of the major revenue accounts, like tuition, are flawed – and remain flawed – even with the new Chart of Accounts."

Such understanding only comes with years of familiarity working in higher education, and specifically at UNT.

3. Information Needs

Overview

The core of our study was an investigation of the information needs of UNT's Chancellor and Presidents and their cabinets. Each interviewee identified a broad range of information needs. In this chapter, we identify key patterns across the study.

Readers should keep in mind that interviewees did not usually distinguish between information needs that will be addressed by the new data warehouse and those that will not. So our discussion of their information needs is holistic and may go beyond the bounds of the D.A.D. Core Team's plans.

We should also note that due to their high organizational level, many interviewees did not personally engage with databases; rather, they had members of their staff obtain the information they needed. This led to a certain vagueness in their interview responses. Some interviewees actually invited a member of their staff to participate in the interview in order to provide a greater level of specificity about use of data and analysis tools.

There was a great deal of individual variation among interviewees depending on:
- Their institution
- Their role
- How long they had been at UNT

Their information needs also varied depending on which kinds of activities the information was needed for:
- Routine work tasks
- One-time projects

As part of our analysis, we labeled each information need as *met*, *not met*, or *partially met* based on the interviewee's comments.

Beyond these different forms of variation, we identified common patterns across the interviews. Some patterns occurred across all campuses in the system, some were specific to an institution, and some were specific to a function. Each of these areas is discussed in turn.

System-Wide Information Needs

Standardized Data for External Reporting

Interviewees across all four institutions needed standard data formats for reporting to external entities. A significant number of interviewees, 9 of 17, said that their office reported to an external body, such as the Board of Regents, the Coordinating Board, or the National Science Foundation. Since good reporting relies on consistency of data, it was of the utmost importance to ensure that all reports follow a standardized format. Most of these high-level reports currently require hours to obtain necessary data and can result in additional pain points, such as those described in Chapter 4. One interviewee suggested that the Chancellor's Office and the Board of Regents should have access to dashboards. This might alleviate some of the heavy demands placed on those who put reports together:

"We have to be responsive to making sure we have good reporting to the Chancellor's office and the Regents and stuff. We need to be able to in a timely fashion get answers to them. And they should in their own right have access to the data and the dashboards they need."

Predictive Information

"Today a chair can see how many they have by race, can see how many they have by gender, by class location, number of degrees awarded, semester credit hours, but that's still the end of it. Okay? And you can make comparisons where you were and where you are today... but there's no forecasting within this at all."

A significant number of interviewees, 7 of 17, said they lack the ability to predict and project using the data currently in their possession. Two of these interviewees said predictive capabilities are a partially met need whereas the other five said they were not met. These interviewees said that such a capability would help them make better decisions, be more strategic, and act competitively against other institutions. Below are a few quotes to illustrate this gap in information available to key decision makers:

"The predictive is what makes the difference between being a transactional reactive… HR department to being strategic and proactive, which is my job. I was brought in to transition it that way. But without the predictive analysis we can't make it. So it's good to try and put together data warehousing, you know. The sooner that they put this together, the better."

"We're building a housing facility and so we need to be able to project who will be living in that and how we're going to go get those students. Who are they? Where are they?"

"One of our conversations was, "that's a great goal, but you can't get there in five years unless you do *this*." So predictive, being able to predict it about that, I think that would help people understand what it's going to take."

"One of the things that we cannot do that is really critical I think, both for the law school, and for UNT Dallas, is to be able to forecast based on our enrollment and the courses that they've taken. What's next? What do we *need* to offer to be strategic?"

Tracking and Mapping Complex Processes

We found that 8 of 17 interviewees said they needed the ability to track certain information needs in order to map out complicated processes. The goal was a greater understanding of the "big picture" which facilitates a higher level of analysis and in turn supports critical decision-making. Figure 1 provides three examples of how tracking data over time can result in improved decision-making. These instances describe information needs that are currently partially met or not met.

Figure 1. Sample Tracking Needs

Tracking and Mapping	**Improved Decision-Making Capability**
Map where marketing materials are sent out to students and how students respond to them.	Adjust the amount of marketing supplies and their type to generate the best impact in different geographic areas.
Follow a successful student to	Identify what makes a student successful and invest more

understand how they progressed and what it took to graduate. Do the same for students who do not make it to graduation.	resources in those areas to foster success. Likewise identify problem areas for students and put resources and training in place so that even advisors can help a student at the first sign of failure.
Track how long it takes new employees to fill out I-9s and complete all necessary training.	Determine how many people need to be hired to effectively transition new employees into their respective institution while maintaining compliance.

Student Data

Since students are an integral part of the university, it is no surprise that 12 of 17 interviewees needed data on students, even if their job did not primarily revolve around student recruitment, enrollment, or retention. Out of those 12 interviewees, five of them needed information on how students are progressing in university programs and the time it takes them to graduate. Interviewees regarded these information needs as not met or partially met. More specifically these interviewees wanted to identify the factors that make a student succeed or fail in a particular program. This led three of the interviewees, representing three distinct institutions, to claim there needs to be a better Early Alert policy in place on each of the campuses. The broad range of institutions represented is a testament to the importance of this issue and may assist in establishing it as a priority in the new data warehouse, or in the related CRM that is also being planned.

Interestingly, interviewees disagreed in their perception of whether some information needs were met or not. For instance the need for general student demographic data was considered either met or partially met by different interviewees. Similarly the ability to track which students attempt to sign up for a class was claimed to be either partially met or not met. Finally, the need for student satisfaction data was identified as met and not met by different interviewees. Below is a breakdown of specific information needs that are met, partially met, or not met in this area.

Met
- General student demographic data (*Also listed as partially met*)
- Data on students who have shown an interest in applying to the university
- Data about the demographic landscape of students such as how many students are enrolled, how many minorities there are, and what majors they're enrolled in
- Non-academic areas a student participates in
- Basic enrollment numbers
- Percentage of students employed by the time they graduate
- Student satisfaction data

Partially Met
- Specific student data in relation to elements on a transcript, such as area of concentration
- Ability to track communication efforts with potential students
- Which students have filled out, completed, and submitted applications
- How students respond to various marketing efforts
- A list of performance indicators, backed by previously collected data, which can be used to determine if a student isn't performing to expectations which then triggers actions to help the student
- A complete profile of what makes a successful student, a mildly successful student, and an unsuccessful student
- Ability to track which students attempt to sign up for a class which is not fully represented by students who are put on the wait list because many choose not to do so (*Also listed as not met*)

Not Met
- Geographical data on students the university wants to go after for recruitment
- Ability to predict whether or not a student will even apply to the university
- Know when to process students for graduation instead of putting the burden on them
- Predictive analytics to schedule better student services
- Consistency in certain data definitions like "county" which should be where students came from and now where they live now
- Student and course data for point in time comparisons
- Data about what students think about the university
- Ability to track students who use the learning commons such as what their grades are and if they succeeded by using the service
- Data on students who said they need academic support matched with data on whether or not they took advantage of academic support services
- Data on how students feel about professors (satisfaction data)
- Combine high school grades of first-time college students with retention/graduation rates
- Ability to track how a student proceeds through the application process from when they heard about the program to when they applied and if they accepted
- Combination of research space data with time to graduation rates of the students who work in those research spaces

Space Data
Approximately one third, or 6 of 17, interviewees said information on space needs is either *not met* or *partially met*. This overarching need breaks out into several finer components. For instance, interviewees need to know which faculty members are in which space, how long they have been there, and exactly how much space they have. This information is needed to understand the one context for faculty productivity.

Faculty Data
In total 10 of 17 interviewees listed faculty data as an important type of information need. These needs spanned all three categories of *met*, *not met*, and *partially met*. Some of the specific subsets of information interviewees needed were faculty workload (partially met), areas of research (met), number of faculty (met), training data on faculty (not met and partially met),

ratios of faculty to students (met), and salaries (met). However, 5 of 17 interviewees, representing three of the institutions, specifically mentioned that faculty productivity data is an important information need. Specifically, 3 of 5 interviewees listed faculty productivity data as *not met* or *partially met*.

Information Needs by Institution
Each institution of UNT has a unique history, strategic goals to achieve, and special projects they are trying to get off the ground. Here are highlights of information needs that interviewees listed in relation to specific institutional activities.

UNT Dallas
- The construction of a new housing facility means that the institution would like to have housing information to project which students will use the new housing facility and the costs associated with it. This information need is partially met.
- The recent split from UNT Denton means that the institution would like to track which students attended UNT Dallas prior to the split and how many of those students left UNT Dallas for UNT Denton and which ones did not in order to draw conclusions about retention. This information is not currently available.
- Since UNT Dallas recently obtained a new President, Bob Mong, this individual will no doubt bring new ideas on how to best guide the institution.

UNT HSC
- Because several members of HSC's senior leadership come from industry, they perceive sharp differences in information access between UNT, a state university, and their prior experience in business. In light of new partnerships being developed with JPS and other medical institutions, they feel an urgent need for better data and analysis tools in order to remain competitive in a fast-moving market environment.
- Since HSC has a clinical practice, unlike other UNT institutions, it has information needs specific to that, ranging from revenue generated per clinic to the number of licensed physicians each one employs. These information needs are being met.
- Strategy and Institutional Research obtain data on the number of graduated students who go on to become licensed or certified – again, this is an issue particular to a medical school, and it is being managed successfully.

UNT System
- The System needs to compare data across the three campuses. For instance, it would be useful to have benchmark information for each of the other institutions and their five year goals. Information needs are partially met in this area.
- The System currently obtains a list of all of the assets that belong to all UNT institutions to assess the financial numbers as a whole.
- Finally, the UNT System is attempting to revitalize the way it captures performance information about each of the other institutions to better develop strategic goals for the growth of UNT as a whole.

UNT Denton
- Denton has basic student information and is now seeking a more sophisticated level of data, granular "drillable academic student data." For instance general student information, such as demographics and ACT scores, could be matched with transcript data including concentration, combined with status as a first generation college

student, what courses they're taking, and what extracurricular activities they're involved in. These information needs are partially but not fully met at present.
- There is also a wish to identify when students are ready for graduation and automatically send them alerts and sign them up, to dissolve any barriers to completing an undergraduate program. This information need is not currently met.
- Denton is successfully collecting data on auxiliary services like the bookstore, athletics, CLEAR, and non-credit operations like the Kristin Farmer Autism Center.
- UNT Denton is undergoing intense renovation and the construction projects on campus affect parking and transportation – these could be managed better with more information.

Information Needs by Function
We grouped the functions of our interviewees into seven categories. Each category is listed below, with one or two sets of information needs that are mostly unique to that function. Please note that there are exceptions and these information needs were chosen based on how common they were among participants representing each function.

General Leadership (3 Interviewees)
- There is a general lack of diverse metrics, benchmarks, and key indicators such as voluntary turnover rates.
- The Presidents need more specific data to drive strong institutional decision making including predictions and projections.
- However, the Presidents do have good general data about students, faculty, and expenditures.

Academic Leadership (1 Interviewee)
- There is no data dictionary for the EIS and Snapshot databases.

Strategy and Institutional Research (4 Interviewees)
- Interviewees in this function would like the ability to combine student and faculty data along with comparison data from other universities to make strategic decisions. This information need is partially but not fully met at present.

Finance (4 Interviewees)
- This function successfully obtains revenue and expenditure data for each department.
- It also successfully obtains data about the financial viability of new ventures and projects.

Students (2 Interviewees)
- Interviewees who work on student issues would like to know which students attempt to sign up for a course but are not successful and are not even on the waitlist; they would like to be able to notify such students if a new section opens up. This is not currently possible.
- People who work in this function also need more specific geographical data on where students are coming from such as zip codes, counties, and states.

Research (2 Interviewees)

- VPs for Research would like to be able to combine data on space, square footage, and expenditures per space with data on the faculty member who utilizes that space for research. For instance, data on the amount of awards and grants the faculty member pulls in compared to the size of their research space. This is not currently possible.
- They also need updated data on specific research interests of faculty and the ability to match that with specific research needs of corporate entities. This information need is partially met at present.

Human Resources (1 Interviewee)

- HR managers require approved data on which employees have finished which sets of training. They also need to track whether or not I-9s are filled out within three days after an employee is officially contracted. Their information needs on these issues as well as other measures of compliance are partially met.
- Although the number of complaints per employee can be obtained, it is done so manually; administrators would like to have an automated tracking process.

4. Pain Points

Many common pain points were identified by interviewees with regard to data warehousing, analysis, and dashboards. The struggles interviewees confronted were not exclusive to one particular function, institution, or level in the organization. Instead, pain points were equal opportunists, popping up in a variety of ways all across the board. The pain points described in this chapter generally emerge from aspects of the organizational context portrayed in Chapter 2.

Since the interviewees occupied high level positions, few accessed much information themselves. Instead this task was executed by other administrators in their area and entities outside of their purview. Not one interviewee claimed that they accessed all of the data they used themselves; 11 interviewees said they did not access any data themselves. Only three claimed to access most of the data themselves.

Pain Points in Obtaining Data
The majority of problems in obtaining data occurred because people didn't know where to find the data. However there could be pain points along every step of the way. The steps to obtaining data were the following:
- Recognizing the need for data
- Determining who can find the data
- That person finds the data and gives it to the requester

Recognizing the Need for Data
In the first step, the administrator realizes they need a certain piece of information or a particular set of data. In general a request for information is made for something more specific than, say, official student enrollment. But this example provides an opportunity to delve into why such a seemingly simple request is anything but. It contains a set of layered complexities rooted in a history of no standards or protocols for how to treat data. For instance, how is student enrollment defined? Does the requester want the 12th day of class number or the number of credit hours? Should the number match another source? Will the number be used for an official report? Do they want to compare the number to past numbers? And the list goes on.

Determining Who Can Find the Data
If the administrator is among those who do not access data themselves, then s/he must determine to whom the data request will be made. Many of the interviewees mentioned first names during the interviews about who their "go-to" person was in the event a data request was made.

That Person Finds the Data and Gives It to the Requester
Once that go-to person is asked to obtain a particular piece of information, then they must pull together a collective set of resources to search for the answer. Sometimes they know exactly which database to pull from or person to contact, but other times they are stuck scratching their heads while they set out to find where the data are housed in the first place or who the data owner is.

While the go-to person is searching, the original requester is left to wait and twiddle their thumbs. There isn't much they can do in the meantime and so maybe a day, a week, or even a month pass by before the report comes back:

> "If somebody's already got it then you just have to find the right person. It could take an afternoon. You know, if somebody has to go do a query to determine that. The success rate of students in their first year who had ACT scores of X, something like that then it can take some time because it's got to get in somebody's work queue. And it could be a week or two before we have the data."

One interviewee who did access his own data described how one question in particular bogged down his office for half a month:

> "It took two weeks to be able to answer that question. We answered it, we had different places, but it took a village to be able to do that."

Sometimes the wait can be blamed on the way an office internally handles the incoming of new information:

> "We have a lot of harassment complaints at UNT and what does that mean? Well, I don't know. They handled two, they handled three, [and] I think twelve this week. Occasionally there's a complaint and we put it in, it goes in the warehouse. And then you start kind of, they're all coming from facilities. What's going on here? So you can go around and try to make sure it just doesn't happen again. Right now we do it, but it takes longer and we do it manually."

The consequences of these wait times to accessing information is an overall inefficiency. People are forced to forgo primary duties to fulfill a request and the requester is left to scrape by without the information they need. Sometimes this can seriously dull a carefully cultivated strategic edge. One interviewee from UNT HSC discussed how other health systems have "a lot more velocity around their data." In general their processes are faster, resulting in better business decisions. It's a frustrating experience because he is always playing the reactive role while the other institutions function faster and throw numbers at him. He has to take the time to respond and the process is cumbersome. Another interviewee from UNT Denton said the time to access information can have serious consequences:

> "It inhibits work and sometimes forces us to make decisions based on what we believe to be true rather than having the solid information that you need."

When we first reported interviewees' comments about data being inaccurate at UNT, the Core D.A.D. Team felt that there was a misuse of the term "inaccurate." However we want to emphasize that data inaccuracy is a perception of the users and a source of concern to them. We found that data inaccuracy was linked to perceived issues in the ways data were collected, or at least to uncertainty about the ways data were collected:

> "Historical information is useless. Our data collection in the past-it's useless if you go past this year. Because their data collection has been so bad and our data definitions I don't-I wouldn't trust them."

"Individual departments are doing their surveys. I don't know... how valid those surveys are."

Pain Points in Analysis, Reports, and Dashboards
With regard to analysis and reports, interviewees identified pain points related to information siloes, uncertainty about data reliability and whether data were used correctly, the high number of ad hoc requests, and the shortage of staff with technology skills.

Information Siloes
One issue that came up regularly was the lack of connection and coordination among multiple data sources and analysis tools. This made analysis of complex issues much more difficult. Here are some examples of frustrations expressed by interviewees:

"It'd be easier for everybody if some of the data talked to some of the other data."

"There's a lot of data mining that occurs and a couple of other software systems that just sort of sits outside of PeopleSoft that makes a little difficult for me to have that, but if that data were to go into a centralized place where it could marry up…"

"Student's mailing addresses need to be connected to this whole student information system and to the college outputs, you know, grades and everything."

"The important thing in my mind is that we can kind of crosswalk that over into the systems that we *are* using so that data actually talks to each other, it's, you know, we can pour information about your interests over-kind of extrapolate that over to, "okay now you've applied. Now you've been admitted. Now you've been registered for orientation. Now you're enrolled." So that all that really merges and gives us the *whole* picture of the student. And right now those are very isolated kinds of things."

"I just need to know what we're going to use, where we want to start, what's most important. I know what we're doing on financial human resource side and you know, the customer service side. I mean IT gives a lot of information itself, you have a lot of specialty systems that capture information. So we just need to figure out how they all work together."

"We got potential leads everywhere, things happening, and all that data doesn't necessarily come back over for us to be able to take any action on it or add the action to what happened over there to here and make sense out of it."

"I'll give you an example, the top 15 students in legal writing and research and the bottom 15 students. I only have their grades. So 22 students with As. I can't *give* you the 15 because I don't know what their final grades were because they don't use the PeopleSoft gradebook but they *do* keep it in CANVAS and they keep the exams in ExamSoft."

Uncertainty about Data Reliability and Whether Data Are Used Correctly
Interviewees expressed deep concerns about the reliability of data and how this might affect the accuracy of their reports. They said data were often stored in multiple places, and there was a lack of documentation on different repositories and what they contained. Furthermore,

software packages used system-wide had been adopted at different times by different people, so there was a historical inconsistency with the way information has been treated. Interviewees had concerns both with the way data made it into the data warehouse, and with how data might get interpreted outside of the data warehouse:

> "If I take a piece of data from here or here or here I could have three different, three different pieces of data because it was collected differently, the definition's different."

> "Sometimes we've had differences in how one *interprets* the data. You said, the whole enterprise right? That would be part of it, it's not just...how we define the data but how we interpret and what we see in the data."

> "There might be an interpretation of what it is, okay? So I know that's a fact, so we might record, like the waiver, I mean, we record it as one way where, again, you know, where Denton might record it is another…If you don't know what that transaction is because somebody put a, let's say not a very clear description of it, you won't know what it is. So and then it just takes research and you have to go in and scrub the numbers."

One interviewee questioned data reliability because he is often not privy to knowing what data has been collected, for how long, and in what way:

> "They take a lot of time, energy and resources to bring out and then maintain and again just because it's there doesn't mean we're collecting it and we can get it all out in a way that's good. Or that we then have the interpretation of it, what does that mean?"

Another interviewee said her main concern is the way different people are using the same data:

> "How does the left hand know what the right hand is doing and how they're using the data to ensure that data is used as it's meant to be used and not used in a way that is not intended?"

As a result of issues with data reliability and interpretation, reports may not be fully accurate, which can lead to embarrassment for officials who present such reports to the Board of Regents or other agencies.

> "The accuracy of the data you know that we have, at least in HRIS, is... less, you know, desirable than you can imagine. So every time that I ask for the Chancellor, or anybody else for a report, the question is that the report is never 100% accurate. And I don't know exactly the history behind it, why, you know, what data did go in that we don't have the right data?"

Ad Hoc Requests
An additional burden shouldered by those who gather information is the volume of the ad hoc data requests they receive. None of these individuals are employed solely for the purpose of attending to such requests, thus the extra work takes time away from their main responsibilities. We found that although the majority of interviewees were leadership receiving the reports from others, they fully recognized the burden placed on their staff to fulfill a constant stream of requests:

> "I can't, *I cannot,* access the UNT data warehouse. I can't access directly data from UNT Dallas, or the Health Science Center. So... whatever data analysis we do we have to rely on other people to do it. It means I think a lot of additional work for people."

> "Almost all the things I ask for are what we call ad hoc data requests. They will crush you."

> "These two guys… they have to stop everything because it's due tomorrow [hits table for emphasis]. And these come in and they do, we had one on Monday that was due on Friday, we got a lot of information. So... but they're, they can only do so much."

The offices for Institutional Research often feel the brunt of a steady ad hoc data request stream:

> "What we end up doing is we will do well over a thousand ad hoc requests per year."

Shortage of Staff with Technology Skills
Interviewees believed that a larger number of IT staff, as well as more technology-savvy staff employed in various functions, would be helpful to address some of these challenges. Such employees could make data sources "speak" to each other and maintain databases more effectively.

One interviewee also voiced a concern that institutional memory may be gradually being lost. Employees are retiring with valuable information about where certain data are located. Due to the complexity of current data management practices, it can take years for a new employee to fully familiarize themselves with the enterprise data landscape.

One interviewee suggested that information-gathering by non-IT professionals could be facilitated by building easy-to-use programs:

> "We need to write, whether it's SQL code, or Hyperion, or whatever kinds of dashboarding we have. We need to be able to write 'build-your-own' query so that you can ask whatever questions you need to on a custom basis without having IT, or the office of research do that for you."

Although some query tools already exist, they are cumbersome to use and require a sizable amount of prior knowledge to run effectively.

We also found that many of these query tools are written with UNT Denton in mind, generating an additional pain point for other institutions. Below are explanations of how queues and cubes cater to the needs of Denton. Ultimately such customization forces others to painstakingly fill in the gaps by hand:

> "Trying to scrub that data where we had to go in and *validate* that information was very tedious because it doesn't give you any detail. You know, it just, then it goes back and you have to make additional requests, you know, we don't think it should be in this column it needs to be over in this column. And that whole process, if it's cube, then we're going to have some serious problems going forward."

"It could be *very* misleading. And that's what we've seen in the past is, because it's in a cube, they're pulling it out of the cube, they think everything should just line up—but it doesn't necessarily. Well, that's where you need some knowledge to say, 'no these go here' or whatever. Explain those."

5. Dashboards: Current and Desired

While few of the interviewees had dashboards at their disposal, most of them were eager to obtain them and envisioned valuable benefits. Only four interviewees already had what they considered a reasonable dashboard. Nearly all of the interviewees said that dashboards would help them identify key information patterns more effectively, which would help them make better decisions and be more strategic.

Current (Lack of) Dashboards

> "Basically when I need information I just ask the experts for it, that's my dashboard! The telephone, whatever it is, email. But in my prior institution I did make more use of electronic dashboards for reporting. I used to work for a much bigger university… and we had a number of institutional dashboards that I was used to. I needed to look up some data, some reports... and there was a lot in there. Now that I think about it I don't know what Denton has but I know we don't have anything here that comes remotely close to that."

We found that interviewees used a variety of resources at their disposal to counteract the absence of robust dashboards. In some cases, as with the interviewee above, people were unsure what resources were available to produce dashboards, even simple ones. Oftentimes this resulted in interviewees taking matters into their own hands and manually producing dashboards:

> "If I were to ask them, or anybody, what are the... give me some performance ratings by categories. They couldn't do that. If I wanted to know about, okay, who are the high potential of UNT or HSC or UNT Dallas or the System, they probably would not capture that. They could, but they do it manually which is not the way to go. It's too time consuming and we don't have enough people."

An interviewee at UNT HSC revealed that he used to have dashboards created for him but then:

> "We lost the dashboard, we had someone working for us that got taken over by ITSS. It's gone now… now I'm relying on somebody telling me something, [and there isn't] even a certainty of the answer!"

Another interviewee noted that the only way to obtain a detailed dashboard was through a combined effort of Decision Support and Institutional Research. They recalled how long it took to put one dashboard in place for one person at one institution:

> "For that budget officer all they've got to do now is come in the morning, turn their computer and they can see all their accounts and where they stand. But it took four months for Decision Support to build the template and then we had to bring all the people in there for three hours to do this just for one report. We have needs for hundreds of reports. It's very cumbersome."

The four interviewees who did have dashboards used one of the following:
- A trial version of Tableau

- Dashboards from the BCG project
- PDFs of graphs, charts, and other figures used as a dashboard
- Dashboard created by an HR project manager when needed

Beyond those four specific cases, six interviewees said they used Excel spreadsheets as dashboard substitutes.

Desired Dashboards

Simplicity
In the interviews, we asked people what features they would find desirable in a dashboard, showing them samples from other universities to stimulate conversation. Overall, interviewees said that the best dashboards were characterized by simplicity. Too many bells and whistles and you can get confused. However, preferred types of graphs and charts varied greatly from person to person. Interviewees did agree that warning indicators in red, yellow, and green could be extremely useful for deciding where to focus their efforts.

We found that interviewees wanted their dashboards to be a one-stop shop where they could pull information quickly and make critical decisions. To facilitate such a process they suggested the following features:
- A list of the top five actions one could take when an indicator shows a warning in red.
- Benchmark information to show where one is currently and where one is compared to peer institutions.
- Warning indicators when something suddenly drops or spikes, alerting the decision maker to do something immediately.
- Metrics and measurements to indicate where one is compared to where one was in the past and also compared to a five year goal.

Customizability and Depth
Although interviewees valued simplicity, they also wanted the dashboards to be customized to their needs, and to have some degree of depth. Eleven people said they would like the flexibility to choose what goes into the dashboard and have the ability to drill down into the data in an easy way:

> "I have thoughts on some things I would like to measure and have at my fingertips. Those are not necessarily the same things the President may be looking for, or the Regents, or somebody else. You know, the colleges, they're going to want to see things specific to them. I'm going to want to see that as well but then I'm going to want to see a bigger view. I want to see how we are as a whole, I want to see down to college, I want to see particular programs, I want to understand impacts and stuff."

> "I'm afraid if there's a static dashboard that just pre-selects information, that's all you can see, that people are going to have questions that aren't answered by a standardized dashboard. They want to be able to manipulate it themselves."

Even when an interviewee said he only needed "a handful of measurements" he ended up describing a highly customized dashboard that would only be useful in his office:

"I think the best dashboards take no more than a handful of measurements. For me, and you know I could clearly define what those would be. And then those would, you know, drill down to two or three measurements apiece. There would be no more, even if I drill down, I don't need to be able to drill down to 50 things. The research people might have my budget office might need that. But what I would need would be access to the major revenue flows, the major expense flows and how they vary compared to where we believe they are. And that enrollment, how it looks compared to our projection enrollment. And if I have, you know, revenue flows against projected revenue flows."

Historical, Real-Time, Predictive
Finally we asked interviewees which type of dashboards would best serve their needs: historical, real-time, or predictive. Predictive was the most popular type, selected by interviewees from all four institutions, followed by historical dashboards, and then finally real-time dashboards.

Deciding which dashboards were more important than others depended on factors such as how long the interviewee had been at UNT or how long the institution had been in place. For instance, one interviewee working at UNT System said historical information in a dashboard format would be helpful because, as a relatively new employee, he was still familiarizing himself with numbers and trends. Two interviewees at UNT Dallas said that predictive dashboards and historical dashboards would be difficult to use effectively because their institution is so new. There isn't enough past information to generate meaningful trends and there aren't enough data to project something like enrollment numbers which have been erratic the last few years.

6. What is Success and How to Get There: Insights from Interviewees

The D.A.D. Core Team wanted to know how interviewees defined success for the D.A.D. initiative, and how they envisioned the path toward achieving success. In this chapter we provide an overview of interviewee responses to these questions.

Definition of Success for the D.A.D. Initiative
While each interviewee had a somewhat different definition of success, we found six common factors that, taken together, generally defined success from the point of view of the interviewees. These factors were:

1. *The Initiative is Perceived as Realistic and Achievable*

   "I don't want us to bite off more than we can... reasonably accomplish. So I guess that would be my first, either caution or definition of success. Which is let's identify something that's achievable."

   "You've got to be realistic, I mean this is a mammoth task, involving multiple institutions, with different priorities."

2. *The Initiative Serves All Institutions Equally*

   "We will need to be able to access the data and make use of it in our own way… going back to the "one size fits all" will not be sufficient. And having some type of derivative of whatever UNT Denton has will not be very helpful."

   "It's got to serve the individual campuses first, right? Yeah, the Board of Regents needs to know some things. We can pull that if we have to, but in the end I would really like to see it serve the best needs of the campuses."

3. *The Initiative Has Resulted in Easier and Quicker Access to Information*

   "If I'm able to log in and run reports on information that I need without having to make eight phone calls... and beg and plead."

   "When… I can use it to get information more quickly and may get information I could not get before. And I would call it success! Even if it's a small increment… anything that gets us to the information that, as quickly as possible, that we really need to do our jobs – that's positively successful as far as I'm concerned."

   "They are able to access [it]. I think it will make things more effective and people can work more effective and get information easier."

   "A visualization tool that allows others to come in, arrange their visualization of what they need. And it would have designated action points so they can come in, quickly look at it, and know what action to take. If they don't know what action to take then

they can choose things that others have chosen. It allows me to get out of the ad hoc business in institutional research to writing visualization items for the dashboards."

4. ***Data Are Perceived as Accurate and Trustworthy, and There Is a Data Dictionary***

"Define data that has been vetted, is clean, is dependable. It's accurate up to within a day."

"When we've identified all the fields that require data definitions and data governance, and we've created our first data warehouse with everything cleaned up according to Hoyle, I would consider that a major victory."

"The accuracy of the data. The ability to get the data out that you need. That it's capturing the data, that it's pulling in the data."

"That the data is available, that it has validity, that it has common definition. That I know… when somebody accesses the data that we're all measuring the same thing at the same time."

5. ***The Initiative Provides Effective Analysis Tools***

"Simply it would have to give us useful reports. It'd have to be useful."

"Being able to evaluate, "okay, so this whole process and all of that predicting actually turned into an accurate decision. An accurate process. An accurate journey." So that we used everything that was available to us and guess what, it all worked. We predicted, we projected, we accessed, and then we got there."

6. ***Potential Users Choose to Use the New Data Warehouse/Analytics/Dashboards and Experience Satisfaction with Their Use***

"The main indicator is that it's used frequently. That would suggest that it's useful information."

"It's the users seeing the value in what they're being provided through the data warehouse. Because if the user doesn't see the value in it and it's the IT folks, as an example, that see the value in it, we missed the boat. It's got to be driven by the customer. I just can't emphasize that enough."

"We anticipate what the customer may want… if you can gain their confidence because the product of what comes out of their warehouse is exactly what they want or more... customer satisfaction. I think that is the number one success."

The Path to Success for the D.A.D. Initiative
Interviewees also identified steps that they considered important for achieving the success of the D.A.D. initiative. These steps can be summarized as follows:

1. ***Include Users in the Development Process (Already Underway through This Research)***

   "Hopefully along the way we're having input through this committee, or this team to have some say in how it's put together."

   "My expectation is you know, that what they're doing right now, which I think is great, is that they're talking to people and they're not trying to build. There's a lot of silo building in this organization. And people who think they understand your business, they build things without you."

   "I just need to know, you know, be part of the discussion about what it is we're-we've had a lot of data warehouses in my life. So I just need to know what we're going to use, where we want to start, what's most important. I know what we're doing on financial human resource side and you know, the customer service side."

2. ***Define a Clear Vision and Scope for the Project***

   "I would like to know is what the scope is of the data warehouse that we're talking about. Then I think we all need to sit down and understand the status of our current data and its limitations, or not. And then I think we need to map out a plan to make sure that when we get to populating the data warehouse. It's not so much the automation of data that worries me, it's making sure that the data that gets populated is the best and most accurate information."

   "I would build a sliding hierarchy that could be adjusted with how much we actually warehoused versus where we said, "local users you take care of that we don't care." Right? So, I would break the world down into data of systemic interest. It has to be utilized across all the campuses."

3. ***Develop a Plan and Timeline to Achieve That Vision, Keeping in Mind That UNT Bureaucracy Tends to Move Slowly***

   "We are like the *Titanic*, it takes us forever to turn this ship. But I think if we have more information, it's vetted better, and people can choose the information they need then they can start making decisions more quickly. And if they do that then we can become competitive with the boats that are out there."

   "What the university has seen in the past year or two, with some of the changes in administration and what we're seeing here is sometimes very fast moving decisions where the university, the community, and the culture need to catch up. So sometimes you get some backlash. But the university as a whole especially publics and large publics, move really slow."

   "Hoping we don't spend seven months defining the initiative, five months agreeing on what we define the initiative to be, six months in doing a bid, six months in doing an analysis, and take forever. That's my main concern is whether or not we can get it done in any reasonable amount of time to be meaningful."

4. ***Identify Staffing and Financial Resources Needed to Achieve the Vision, and Obtain These Resources***

"Division of responsibilities from the start because there's an infrastructure piece, warehouse, of managing it, who's responsible for the design, right? Some of the data definitions and everything else, so there's different pieces. Is it the same person or a group? Or who's building the dashboards and reports out of it? Is it more centralized? Is it all distributed? So then who's going to do the training? Having that plan all worked out I can tell you was, is, key for any implementation, but it's going to be key on this."

"Okay, this is great, we're going to have this new tool-what's it going to cost me? I don't mean me, but what's it going to cost my budget, our division's budget? What's it going to cost the university? Is it going to be worth the cost? You know value equals quality over cost, are we going to get good quality, reasonable cost? Is the value equation going to work out in our benefit or not?"

5. ***Build on Existing Repositories and Tools; Be Aware of and Respect Efforts People Have Already Made***

"I think we need to, I need to understand the complementary working relationship between various information technology packages that we have. And which one is going to be the source for... which reports."

6. ***Address Organizational Causes of Technological Problems, Such as Core-Periphery Bias***

"I'm hoping that if there is a system-wide warehouse that it will be customizable for each campus. That you have a, perhaps a menu, or a way of customizing reports. Rather than a one size fits all."

"One size fits all doesn't always work… I'm not sure some tool that is developed to deal with trying to map the clinical enterprise is really going to be much use to UNT Denton. And so vice versa. So I-I like the concept of this data warehouse but I don't want us to be serving it. I would rather it to be serving the needs of the campuses."

7. ***Develop Data Handling Processes That Ensure Accuracy and Trustworthiness of Data***

"We agree on a common set of definitions of the data, who gets access to it, when certain pieces of data are collected, when they're archived into data warehouse, when you work with them live. We don't have any of that data discipline, we don't have discipline related to that."

8. ***For All Data Involved, Identify Ownership, Access, Responsibility for Management, and Security Measures***

"I would have some concern about ownership… and access. So if we create a more merged, you know, big mama database, I wouldn't want to think we'd have to go

through some iteration of permissions… I would want to be sure we had clear and unfettered access to things."

"Security around data sources. Obviously if there are student names in there you don't want to have anyone have access to that that shouldn't. So who's, you know what's your tier access, at what level for data?"

"If I'm going to give somebody access to the data, I don't want the same access to be able to log in to make a general entry. From an accounting point of view and from, for control, it may not be too ideal. You can give it to like an administrator which is fine, but not to, you might have a student employee who is going to work here and might work here for six months."

9. ***Once New Systems Are in Place, Provide Training in Data Management and Use of Analysis Tools; Users Who Are Not Experienced in Business Processes Especially Need to Learn How to Use Dashboards and Other Tools***

"The general group of academics that are department heads today have little if any business acumen. And they, you know, so just to give the data without taking the time to invest in them to be able to say, how do you use this data or why are we giving you this data?"

"You will have to have training in there."

10. ***Start with Low-Hanging Fruit at Each Institution, Get Some Quick Wins***

"You've got to be realistic, I mean this is a mammoth task, involving multiple institutions, with different priorities… you've got to pick the low-hanging fruit and have an early win. If you don't have an early win, you're going to have a hard time keeping people engaged."

"Maybe you don't build a BMW, I don't know a Chevy"

7. Other Recommendations

In conclusion, we offer seven additional suggestions for the D.A.D. initiative that may not have been explicitly articulated by the interviewees, but that became evident through our analysis of the transcripts. Many of these suggestions follow directly from the findings reported in earlier chapters.

Each recommendation is introduced with a summary of the finding that inspired it.

1. Maintain Communication about the Initiative with Interviewees and Others
- *Finding*. Interviewees were generally happy to be involved in the interview process and hoped they were contributing to the initiative. However all 17 interviewees expressed concerns regarding the initiative. Interviewees also expressed a desire to be continuously involved.
- *Recommendation*. Maintain contact with interviewees throughout the initiative by sending out emails or inviting them to learn about the latest decisions and improvements. Show how user needs are being addressed in the initiative. Maintain a feedback loop so that users can communicate problems and ideas for improvement.

2. Highlight Steps Toward Success
- *Finding*. As described in Chapter 6, interviewees were concerned about whether the initiative would realistically be able to accomplish its goals. They also hoped that the initiative would be customer-focused.
- *Recommendation*. Users will be happy to see even incremental changes that make their work easier, so we suggest that any improvements made to alleviate common pain points be widely communicated.

3. Ensure That Dashboards Are Simple but Customized
- *Finding*. As described in Chapter 5, we found that the use of dashboards was limited at UNT, and that interviewees wanted dashboards that were simple but customizable
- *Recommendation*. Simple but customizable dashboards are a solution to the need for access to information that can improve decision-making. Other tools such as a "build your own query" can also facilitate customization and easy access to information. We suggest these tools take the form of a mobile app or intuitive "drag and drop" functionality. Such designs would align with the way users currently interface with technology, requiring less time and effort for training and recognition.

4. Ensure that Dashboards and Reports Include the Ability for Users to Drill Down
- *Finding*. Six interviewees said they would like to be able to drill into the information summaries provided in reports and dashboards to examine data in greater detail.
- *Recommendation*. When creating reporting tools and dashboards ensure that users have options for further drilling so that those who require such detail have the opportunity and those who have never had the prospect can now experiment if they feel so inclined.

5. Strengthen Predictive Capabilities
- *Finding*. As described in Chapter 5, eight interviewees stated that predictive capabilities were paramount to becoming a strategic, proactive institution that can make informed business decisions, exist competitively, and better serve students
- *Recommendation*. Develop dashboards that can project information into the future while also providing benchmarks and comparisons so that administrators can effectively use the projected information in a realistic way.

6. Accommodate New Technology Developments
- *Finding*. Interviewees are receiving requests based on new technology developments such as web analytics, big data, and social media. Some of these information needs are addressed by the D.A.D. initiative but some are not.
- *Recommendation*. We suggest particular attention be paid to data requests on topics that are unfamiliar or where data do not exist. These gaps in knowledge may illustrate opportunities to collect new types of information that will make the university more competitive. The data warehouse should include the flexibility to include new types of information.

7. Enable Users to Contribute to Institutional Memory
- *Finding*. We found that many software tools are somewhat opaque for new users, and that employees are retiring before they can fully train their replacements.
- *Recommendation*. We suggest there be a feature that allows users to write comments that others can read. That way when someone completes a query, they can share it and provide notes that address challenges, such as where to find information in different repositories. A steady stream of comments could build on the work others have already completed and continually refine the querying and reporting process.

Appendix: Interview Guide

Note: All interviews will be conducted using an ethnographic, semi-structured approach so discussion topics are listed rather than precisely worded questions.

Project Background
The Data Warehousing/Analytics/Dashboards Project is one of several UNT System information technology (IT) projects. Neal Smatresk is the sponsor.

Phase 1 of this project focuses on identifying the information needs of the Chancellor, the Presidents, and their staff for carrying out various responsibilities, including decision making, reporting, assessment, and other job activities. The interviews we are conducting have the following objectives:

1. To understand the experience of key users when using current UNT institutional information.
2. To understand information needed by key users to carry out their responsibilities (decision making, reporting, assessment, etc.).
3. To inform the design and implementation of a robust enterprise data environment for UNT System and UNT campuses that meets the needs of its users.
   - o An enterprise data environment includes all aspects of data collection, management, governance, storage, preservation, analysis, and reporting.
   - o A data warehouse is a storage facility housing data that users can access for reporting and analysis.
   - o Various applications and tools are used to search information in the data warehouse, select appropriate data, and analyze the data to create reports for the users. One tool that is used in presenting data is called a dashboard, which visually displays analyzed data to the user.

This interview with you is important to our project. As the [current position], we are very interested in your ideas and thoughts related to your use of information. We want to know what your responsibilities are and understand the demands for reliable and useful information, data, and reports that a robust data warehouse and its tools can provide. Listening to your experiences and needs will contribute to a new enterprise data environment that works for users.

A: Study Participant Background
I know that your current position is [position name] and that you have been in that position for [length of time], but I am interested in knowing more about your work and responsibilities. Can you talk to me a bit more about that?
- *Note: This is intended to break the ice, and begin to build rapport with the study participant.*

B: Work Responsibilities and Information Needs
- In regards to your work at/with [Institution name] what are your primary responsibilities?

- What are your information needs to fulfill those responsibilities?

- Who are the people or units you go to, or rely on, for the information you need?

- ***For each responsibility identified, ask**: what information (i.e. about faculty, students, staff, courses, research, etc.) do you need to use in carrying out your responsibilities?*
  - What do you do to get information in the form you need?
  - Was that an easy process to request and acquire?
  - Was this satisfactory or do you have suggestions for improvement in the process or in the resulting information?
  - In an ideal world, what information would you be able to access for this task/decision? What would the data look like? What level of detail, what format, etc.?

- Can you describe a time when accurate, appropriate, and useful data were not available or not available in a timely manner?
  - What about a time when you needed to make a decision?
  - What about a time when you needed to take action on something?
  - What are the consequences of these problems? Is there a negative impact on your ability to make decisions? What decisions are affected?

- Describe one or more information or data sources at UNT you have used that you consider good examples of what you would like for all your work needs.
  - Why do you consider [data source] to be such a good example?
  - How do you access that information?
  - What about examples from other places you have worked?

- Describe one or more information or data sources at UNT you have used that have not been of the quality or utility you need for your work.
  - What are the issues with the information or data?
  - Who provides you that information or data?

- What are the major challenges in doing your job because of issues with information/data?

C: Dashboards and the UNT Enterprise Data Environment
While there are many different reporting formats that can be useful for decision making and other tasks. In recent years, dashboards have been developed to show visually, and at a glance, key performance indicators relevant to a process or group of people.

The dashboards in our handout give you some examples from higher education. As you can see, these are limited to a particular process or situation, and they show summary and trend information, comparisons, etc., and use visual elements to present the information.

- Have you used dashboards in any of your work tasks – either here at UNT or elsewhere?
- Do you like using dashboards to view important information?
  - What are some positive aspects of dashboards that have been helpful to you?
  - What are some difficulties you experienced with dashboards?

There are many different kinds of dashboards. Some can present historical information that is static, but others can do the following:

- Present data that is refreshed on a timely basis, including trend information based on the refreshed information
- Present data and also have predictive capabilities – that is, it can do "what if analysis" and "modeling"
- What is your preference for one or more of these dashboards if they were to be developed?
  - Why would you prefer [dashboard type]?
  - Why don't you prefer [the other dashboard type]?
- Given what we have discussed about dashboards and other reports, can you think of any other reporting or presentation features you would like in the new UNT enterprise data environment?
  - Provide a list of possible features as probes for the participant.

D: Assessing Success
- Considering that UNT is about to make a considerable investment in our enterprise data environment, measuring its success needs to be planned for. We are interested what you consider the criteria for success:
  - What are your criteria for success? (probe: for example, receiving data that don't require any manipulation for analysis or the ability to make better and more data-driven decisions)
  - How will you know that this effort has been successful?
  - What are your expectations for the quality of the data in the data warehouse?

E: Wrapping Up
- Is there anything I haven't asked about yet that I should have asked you?
- Is there anyone you think we should talk to/interview for this initiative?
- Do you mind if I send an email with any follow-up questions I may have regarding our discussion today?

Thank you!!!